CROPS RESEARCH

ARS 34-54
March 1963.

A SLIDE RULE CALCULATOR FOR DETERMINING DOSAGES OF CHEMICALS FOR SMALL PLOTS 1/

W. M. Phillips 2/

One of the factors of utmost importance for conducting field plot research with herbicides, insecticides, fertilizers, or other similar materials is to determine accurately the amount of material to apply per plot. Tables can be prepared to give plot sizes, rates per acre, and percentage or pounds per gallon of active ingredient. Such tables are reasonably satisfactory for use with liquid formulations that contain more or less standard concentrations of active ingredient, e.g., 1, 2, and 4 pounds per gallon. However, there is little standardization in the percentage of active ingredient of dry formulations. The concentration may vary from very low in the case of granular products to very high in wettable powder or soluble formulations.

Various charts, nomograms, and modified slide rules have been prepared to aid in dosage calculation, but many of these have been designed for field-scale application. Sherwood and Wittman 3/ described a group of six systematized charts designed for calculating dosages for small field plots.

The slide rule calculator shown in figure 1 is versatile, simple, and accurate. Although designed for use with dry formulations, it can be used for any material when the concentration is expressed in percentage and the determination of the amount of formulation per plot is made on a weight basis. It could no doubt be adapted for calculating milliliters of liquids.

1/ Cooperative investigations of the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, and the Kansas Agricultural Experiment Station. Contribution No. 175, Fort Hays Branch, Kansas Agricultural Experiment Station, Hays, Kansas.

2/ Research Agronomist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Hays, Kansas.

3/ Sherwood, L. V. and Wittman, D. W. A selectomatic herbicide calculator (Abstract) Weed Society of America Proceedings p. 7, 1961. [Processed.]

Agricultural Research Service
U. S. DEPARTMENT OF AGRICULTURE
in cooperation with the
KANSAS AGRICULTURAL EXPERIMENT STATION

Figure 1.--Slide rule calculator assembled for use. Scales are arranged as follows: A, Plot size in square feet; B, pounds of active ingredient per acre to be applied; C, percentage of active ingredient of the material being used; and D, grams of material needed for the selected plot size.

The range on the "Plot Size" scale is sufficient to include most commonly used plot areas. The "Percent Active Ingredient" scale covers all possible percentages, including fractional parts. The "Rate of Application" scale includes a wide range and should cover most of the rates used. A factor of 10 may be used when rates of less than 1 pound per acre are calculated. Because of limitation on the length of the scales, certain combinations of high concentration of ingredient and low rate of application or low concentration and high rate of application cannot be read on the "Grams per Plot" scale.

Instructions for Use

1. Determine size of plot to be treated. Slide the upper movable scale until the index points to the desired plot size. Hold in place. (A locking mechanism on this scale would be desirable.)

2. Move the lower sliding scale until the percentage of active ingredient contained in the product is matched with the desired rate of active ingredient as shown on the upper movable scale.

3. Read grams per plot at the index located below the lower sliding scale.

The reading from the calculator represents the number of grams of a given material necessary to treat one plot. This figure can be used when plots are treated individually, or it may be used as the basis for determining the total material needed to treat all replications plus a given surplus.

This device has been used since 1960. In practice it has been found, for example, that if 3 replicate square rod plots (272 sq. ft. each) are to be treated with a spray solution in a sprayer calibrated to deliver a total volume of 40 gallons of water per acre (1 quart per square rod) the calculator reading multiplied by 4 will give the amount of material needed for 1 gallon of mix.

When this device was first designed and used, there was some question concerning the accuracy with which it could be read. If the indices are correctly placed and are drawn to a fine point, the calculator can be read to an accuracy of +1 or -1 percent. Due to the nature of logarithmic scales, the smaller numbers may be read most accurately, but the percentage error should be approximately the same at both ends of the scale.

Construction Details

The materials used to construct the working model shown in figure 2 consisted of a few small pieces of 1/8-inch fiberboard and a sheet of semi-logarithmic graph paper. Work was done with a small jigsaw and a few simple hand tools. Rigid plastic or a blank slide rule with two sliding scales could no doubt be used to advantage.

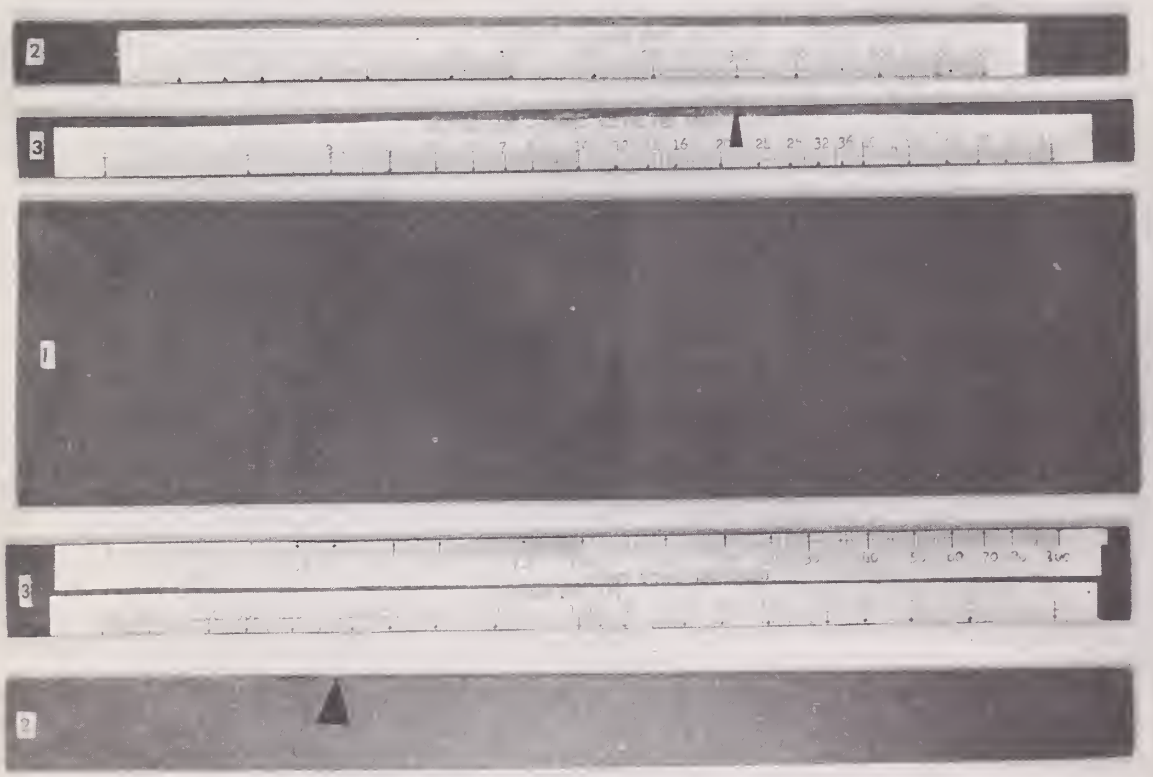

Figure 2.--Component parts of the slide rule calculator prior to assembling.

The parts of the slide rule calculator before assembling are:

1. Base - $3\frac{1}{4}$ X 12-inch fiberboard.

2. Upper and lower slide guides 5/8 X 12 and 1 X 12-inch fiberboard, respectively, glued to base to form a channel for the two sliding scales.

3. Upper and lower sliding scales 5/8 X 12 and 1 X 12-inch fiberboard, respectively.

Strips of semilogarithmic graph paper are appropriately marked, cut, and glued in place. The marks could be etched directly onto the scales, if care is taken to preserve the logarithmic progression in all the divisions and subdivisions. In all cases doubling of a numerical value must be accomplished in precisely the same distance on all scales. Note that the "Grams per Plot" scale reads in descending order from left to right.

For convenience, the "Plot Size" index is located so that the more commonly used plot sizes would be indicated when the upper slide is approximately centered. The location of the index for "Grams per Plot" is determined by carefully calculating the grams of a product with a given percentage of active ingredient needed to treat a given plot size at a given rate.

After the calculator is assembled, it is sprayed with a clear acrylic coating to protect the otherwise fragile graph paper.